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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/867,464	05/31/2001	Takahisa Kikuchi	209294US-2	6875

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EXAMINER	
LAU, TUNG S	
ART UNIT	PAPER NUMBER
2863	

DATE MAILED: 06/16/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

A-A

Application No.	Applicant(s)	
09/867,464	KIKUCHI, TAKAHISA	
Examiner	**Art Unit**	
Tung S Lau	2863	

Offic Action Summary

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *5-14-2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-12 and 14-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12,14-31 and 33-38* is/are rejected.

7)☒ Claim(s) *32* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 5, 19, 2, 3, 4, 9, 10, 11, 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Sato (U.S. Patent 5,499,099).

Regarding claim 1:

Sato discloses an evaluation method that evaluates regularity and degree of a nonlinear distortion of a substrate, comprising obtaining, for a plurality of divided areas on a substrate (Col. 3, Lines 30-46, fig. 4a, 4b) , position deviation amounts relative to predetermined reference positions by detecting respective marks (fig. 4a, 4b), which are provided corresponding to said plurality of divided areas (fig. 4b); and evaluating regularity and degree of a nonlinear distortion of said substrate by using an evaluation function that is used to obtain correlation (Col. 3-4, Lines 48-3) , concerning at least direction, between a first vector representing said position deviation amount of a given divided area on said substrate and second vectors each of which represents said position deviation amount of a divided area of a plurality of divide areas around said given divided area (Col. 3-4, Lines 48-3).

Regarding claim 5:

Sato discloses a position detection method that detects pieces of position information to be used to align each of a plurality of divided areas on a substrate with respect to a predetermined point, said method comprising calculating said piece of position information through use of a statistic computation using measured position information obtained by detecting said plurality of marks on said substrate (Col. 3, Lines 31-47); and determining, for said piece of position information, at least one of a correction value and a correction parameter that determines said correction value, by using a function that is sued to obtain correlation, concerning at least direction (Col. 3-4, Lines 48-3) , between a first vector representing a position deviation amount of a given divided area on said substrate and second vectors each of which represents a position deviation amount of a divided area of a plurality of divide areas around said given divided area (Col. 3-4, Lines 48-3), said position deviation amount of said first vector being relative to a predetermined reference position, said position deviation amounts of said second vectors being relative to respective predetermined reference positions (Col. 4, Lines 4-31).

Regarding claim 19:

Sato discloses a position detection method that detects a piece of position information to be used to align each of a plurality of divided areas on a substrate with respect to a predetermined point, said method comprising: grouping, for a second or later (n'th) substrate of a plurality of substrates (Col. 3-4, Lines 48-3), a plurality of divided areas on said substrate into blocks beforehand based on

indices representing regularity and degree of a nonlinear distortion of at least one of substrates earlier than said n'th substrate so as to detect a piece of position information of each of said plurality of divided areas of said plurality of substrates (Col. 3-4, Lines 48-3, fig. 6a, 6b), said indices being obtained by evaluating, through use of a predetermined evaluation function (Col. 6, Lines1-50), measured position information in accord with position deviations (Col. 6, Lines1-50), relative to said predetermined point (Col. 6, Lines1-50), of said divided areas on said at least one of substrates earlier than said n'th substrate (Col. 3-4, Lines 48-3, fig. 6a, 6b); and determining said pieces of position information of al divided areas belonging to each of said blocks by using measured position information in accord with position deviations (Col. 6, Lines1-50), relative to said predetermined point, of a second number of divided areas, said second number being smaller than a first number (Col. 3-4, Lines 47-3) , which represents a total number of divided areas belonging to each of said blocks (Col. 4, Lines 4-20).

Regarding claims 2, 3, 4, 9, 10, 11, 20:

Sato disclose the use of directional ad size of the vector (Col. 6, Lines 1-15), use of a evaluation function (Col. 6, Lines 1-15), averaging calculation (Col. 4, Lines 37-39), use the mark position in a stationary coordinate (fig. 6b, Col. 6, Lines 1-15), complement function optimized (Col. 6, Lines 1-15), n being large or equal to two (fig. 6b),

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

a. Claims 14, 22, 31, 38, 6, 7, 8, 12, 15, 16, 17, 18, 21, 23, 24, 33, 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 5,499,099) in view of Irie et al. (U.S. Patent 5,808,910).

Regarding 14

Sato discloses a position detection method that detects a piece of position information to be used to align each of a plurality of divided areas on a substrate with respect to a predetermined point, wherein for a second or later (n'th) substrate of said plurality of substrates (Col. 4, Lines 1-20), so as to detect a piece of position information of each said plurality of divided areas of a plurality of substrates (Col. 4, Lines 4-20), are used a linear component of apiece of position information of said divided area obtained by performing a statistic computation using measured position information in accord with position deviations of at least three specific divided areas relative to said predetermined point specified in design-position information (Col. 6, Lines 1-37), and a nonlinear component of a piece of position information of said divided area on at least one of substrates

earlier than said n'th substrate (Col. 6, Lines 1-37), said measured position information being measured by detecting a plurality of marks on said n'th substrate (fig. 6b, Col. 3-4, Lines 48-3), and said nonlinear component of a piece of position information of each of said divided areas is calculated based on a single complement function optimized based on indices of regularity and degree of a nonlinear distortion (Col. 6, Lines 1-37), of at least one of substrates earlier than said n'th substrate (Col. 7, Lines 1-11), that are obtained by, through use of a predetermined evaluation function (Col. 7, Lines 1-11), evaluating pieces of measured position information of said divided areas on said substrate (fig. 6a, 6b), and based on a nonlinear component of a piece of position information of said divided area on at least one of substrates earlier than said n'th substrate (Col. 6, Lines 1-67).

Regarding 22

Sato discloses a position detection method that detects a piece of position information to be used to align each of a plurality of divided areas on a substrate with respect to a predetermined point (fig. 6a,6b), said method comprising by using a function that is used to obtain correlation (Col. 3-4, Lines 31-3), concerning at least direction (fig. 6b), between a first vector representing a position deviation amount of a given divided area on said substrate and second vectors each representing a position deviation amount of a divided area of a plurality of divide areas around said given divided area (Col. 4, Lines 4-20), said position deviation amount of said first vector being relative to a predetermined

reference position (fig. 6b), said position deviation amounts of said second vectors being relative to said predetermined reference position; obtained by detecting a plurality of marks on said substrate (Col. 4, Lines 4-31).

Regarding 31

Sato discloses an exposure method that forms a predetermined pattern on each of a plurality of divided areas on a substrate by sequentially performing exposure of said plurality of divided areas on said substrate, said exposure method comprising measuring pieces of position information of mark areas each corresponding to a respective mark by detecting a plurality of marks on a reference substrate (fig. 6a, 6b); obtaining, pieces of calculated position information of said mark areas, each having a linear component of position deviation amount thereof (Col. 6, Lines 1-67), relative to a design value of a respective mark area, corrected; making a first correction map including pieces of correction information used to correct nonlinear components of position deviation amounts of said mark areas (fig. 6b), based on said pieces of measured position iformation and said pieces of calculated position information (Col. 6, Lines 1-67), each of said position deviation amounts being relative to a design value of a respective mark area (fig. 6b); converting, before exposure, said first correction map to a second correction map (Col. 3-4, Lines 35-3) , based on information concerning a designated arrangement of divided areas (fig. 6b), said second correction map including pieces of correction information used to correct nonlinear components of position deviation amounts of said divided areas (Col.

6, Lines 1-50), each of said position deviation amounts being relative to a reference position of a respective divided area of said divided areas (fig. 6b); and calculating pieces of position information, used to align each divided area with respect to a predetermined point (fig. 6b), based on measured position information obtained by detecting a plurality of marks on said substrate and performing, while moving said substrate based on said pieces of position information and said second correction map, exposure on said divided areas (Col. 3-4, Lines 35-23).

Regarding claim 38:

Sato discloses an exposure apparatus that forms a predetermined pattern on each of divided area on a plurality of substrates by performing exposure on said substrates, said exposure apparatus comprising a judgment unit of judging how large differences of overlay errors between a plurality of lots are (abstract), said lots including a lot to which a substrate subject to exposure belongs (Col. 3-4, Lines 31-3) ; a first controller that, when said judgment unit judges that differences of overlay errors between lots are large, upon exposure for each of a predetermined number of first and following substrates of said lot, calculates pieces of position information used to align each divided area with respect to a predetermined point, calculates nonlinear components of position deviation amounts (Col. 6, Lines 1-67), relative to respective predetermined reference positions (fig. 6b), of said divided areas by using said measured position information and a predetermined function (Col. 6, Lines 1-67), and moves said

substrate based on said pieces of position information calculated and said nonlinear components, and upon exposure for each of the other substrates in said lot (Col. 3-4, Lines 31-3), calculates pieces of position information used to align each divided area with respect to a predetermined point, and moves said substrate based on said pieces of position information calculated and said nonlinear components calculated (Col. 6, Lines 1-67); and a second controller that, when said judgment unit judges that differences of overlay errors between lots are not large (abstract), upon exposure for each substrate of said lot, calculates pieces of position information used to align each divided area with respect to a predetermined point, and moves said substrate based on said pieces of position information calculated and a correction map that is made beforehand and composed of pieces of correction information used to correct nonlinear components of position deviation amounts, relative to respective reference positions, of a plurality of divided areas on a substrate (abstract, Col. 3-4, Lines 30-20).

Regarding 6, 7, 8, 15, 12, 16, 17, 18, 21, 23, 24, 33, 34:

Sato discloses the use of the value to correct the deviation calculation (Col. 3-4, Lines 47-3), position are relative of the divide area (fig. 6a, 6b), equation conversion (Col. 6, Lines 1-15), the n position is larger than or equal to two (Col. 6, Lines 4, fig. 6b), complement function (Col. 6, Lines 1-15),

Sato dos not disclose the use of statistical computation, weight parameter, fourier series function, lithography process, Irie discloses the use of statistical computation (Col. 3-4, Lines 25-22), weight parameter (Col. 15-16, Lines 25-40), fourier series function (Col. 6, Lines 13-34), lithography process (Col. 1, Lines 15-31), in order to have a high accuracy and high speed even though a sample has a nonlinear error (Col. 3, Lines 19-23).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sato to have the use of statistical computation, weight parameter, fourier series function taught by Irie in order to have a high accuracy and high speed even though a sample has a nonlinear error (Col. 3, Lines 19-23).

b. Claim 25, 26, 27, 28, 29, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 5,499,099) in view of Irie et al. (U.S. Patent 5,808,910) and Tomimatu (U.S. Patent 6,239,858).

Regarding claim 25:

Sato discloses an exposure method that forms a predetermined pattern on each of a plurality of divided areas on a substrate by sequentially performing exposure of said plurality of divided areas on said substrate, said exposure method comprising making, for each of at least two conditions concerning said substrate,

beforehand at least a correction map based on measurement results of a plurality of marks on a specific substrate (fig. 6b), said correction map being composed of pieces of correction information used to correct nonlinear components of position deviation amounts (Col. 6, Lines 1-50), relative to respective reference positions, of a plurality of divided areas on said substrate (fig. 6b); selecting a correlation map corresponding to a designated condition before exposure (Col. 3-4, Lines 35-3) ; and calculating pieces of position information used to align each divided area with respect to a predetermined point (fig. 6b), based on measured position information obtained by detecting a plurality of marks provided corresponding to each of a plurality of specific divided areas on said substrate and performing, after having moved said substrate based on said pieces of position information and said selected map, exposure on said divided areas (Col. 4, Lines 4-33).

Regarding claims 26, 27, 28, 29, 30 :

Sato discloses different process for a specific substrate (Col. 3, Lines 20-37), belong to a specific area division (fig. 6b),

Sato dos not disclose the use of statistical computation and correction map technique, weight parameter, lithography process. Irie discloses the use of statistical computation (Col. 3-4, Lines 25-22), weight parameter (Col. 15-16, Lines 25-40), lithography process (Col. 1, Lines 15-31), to have a high accuracy and high speed even though a sample has a nonlinear error (Col. 3, Lines 19-23), Tomimatu discloses the use of correction map technique (Col. 1, Lines 60-

64), to reduce nonlinear error generated from semiconductor substrate (Col. 2, Lines 21-28).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sato to have the use of statistical computation and correction map technique taught by Irie and Tomimatu in order to have a high accuracy and high speed even though a sample has a nonlinear error and to reduce nonlinear error generated from semiconductor substrate.

c. Claim 39 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 5,499,099) in view of Koga et al. (U.S. Patent 5,986,766).

Regarding claim 39:

Sato discloses an exposure method that forms a predetermined pattern on each of a plurality of divided areas on a substrate by performing exposure on said divided area (fig. 6b), said exposure method comprising selecting a first alignment mode (abstract, Col. 3-4, Lines 36-3), when, based on overlay error information of an exposure apparatus used in exposure of said substrate (abstract), and a second alignment mode different from said first alignment mode, and determining respective pieces of position information of said divided areas based on pieces of position information obtained by detecting a plurality of

marks on said substrate using said selected alignment mode (Col. 3-4, Lines 35-3).

Sato does not disclose the errors between divided areas on said substrate are predominant, Koga disclose the errors between divided areas on said substrate are predominant (Col. 6-7, Lines 55-6), in order to have a high throughput and high precision for alignment execution of the design position (Col. 3, Lines 45-48, abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sato to have the errors between divided areas on said substrate are predominant taught by Kogain in order to have a high throughput and high precision for alignment execution of the design position (Col. 3, Lines 45-48, abstract).

d. Claim 35, 36 and 37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sato (U.S. Patent 5,499,099) in view of Irie et al. (U.S. Patent 5,808,910) and of Koga et al. (U.S. Patent 5,986,766).

Regarding 35, 36, 37:

Sato discloses an exposure method that forms a predetermined pattern on each of a plurality of divided areas on a plurality of substrates by using a plurality of exposure apparatuses including at least one exposure apparatus capable of correcting distortion of projected image and sequentially performing exposure of

said divided areas on said substrates (abstract), said exposure method comprising an analysis step of analyzing overlay error information (Col. 3-4, Lines 35-3), measured beforehand, of at least one specific substrate that has been through the same process as said substrates (Col. 3-4, Lines 35-3); a first judgment step of judging, based on said analysis results, whether or not errors f between divided areas on said specific substrate, said errors between divided areas being caused by position deviation amounts having different translation components from each other (Col. 3-4, Lines 35-3); a second judgment step of, when in said first judgment step it has been judged that said errors between divided areas (Col. 3-4, Lines 35-3), judging whether or not said errors between divided areas have a nonlinear component (Col. 6, Lines 1-67); a first exposure step of, when in said second judgment step it has been judged that said errors between divided areas have no nonlinear component (Col. 6, Lines 1-67), with using an arbitrary exposure apparatus, calculating pieces of position information used to align each divided area with respect to a predetermined point (Col. 6, Lines 1-67), by a computation using measured position information obtained by detecting marks corresponding to each of a plurality of specific divided areas on each of said plurality of substrates and sequentially performing exposure on said plurality of divided areas of each of said plurality of substrates so as to form said pattern on each divided area, while moving said substrate based on said pieces of position information (fig. 6a, 6b); a second exposure step of, when in said second judgment step it has been judged that said errors between divided areas

have a nonlinear component, with using an exposure apparatus that can perform exposure on substrates correcting said errors between divided areas (abstract), sequentially performing exposure on said plurality of divided areas of each of said plurality of substrates so as to form said pattern on each divided area; and a third exposure step of, when in said first judgment step it has been judged that said. selecting an exposure apparatus capable of correcting distortion of said projected image and, with using said selected exposure apparatus, sequentially performing exposure on said plurality of divided areas of each of said plurality of substrates so as to form said pattern on each divided area (Col. 7-8, Lines 2-67) .

Sato does not disclose the use Predominant and statistic calculation, Irie discloses the use of statistical computation (Col. 3-4, Lines 25-22), in order to have a high accuracy and high speed even though a sample has a nonlinear error (Col. 3, Lines 19-23), Koga disclose the errors between divided areas on said substrate are predominant (Col. 6-7, Lines 55-6), in order to have a high throughput and high precision for alignment execution of the design position (Col. 3, Lines 45-48, abstract).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sato to have the use Predominant and statistic calculation taught by Irie and Kogain in order to have a high accuracy and high

speed even though a sample has a nonlinear error and a high throughput and high precision for alignment execution of the design position.

Claim Objections

3. Claims 32 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all the limitation of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance: prior art fail to teach the use of Gauss distribution.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

4. Applicant's arguments with respect to claims 1, 5, 19, 2, 3, 4, 9, 10, 11, 20 have been considered but are moot in view of the new ground(s) of rejection.

However, applicant's arguments filed 5/19/2003 have been fully considered but they are not persuasive.

A. Applicant argues that the prior art does not show 'the grouping of area based on nonlinear error'. Sato discloses the 'the grouping of area based on nonlinear error' in abstract and Col. 6, Lines 1-67, fig. 6b).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tung S Lau whose telephone number is 703-305-3309. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Barlow can be reached on 703-308-3126. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-5841 for regular communications and 703-308-5841 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

TC2800 RightFAX Telephone Numbers : TC2800 Official Before-Final RightFAX - (703) 872-9318, TC2800 Official After-Final RightFAX - (703) 872-9319

TC2800 Customer Service RightFAX - (703) 872-9317

TL June 9, 2003

John Barlow
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